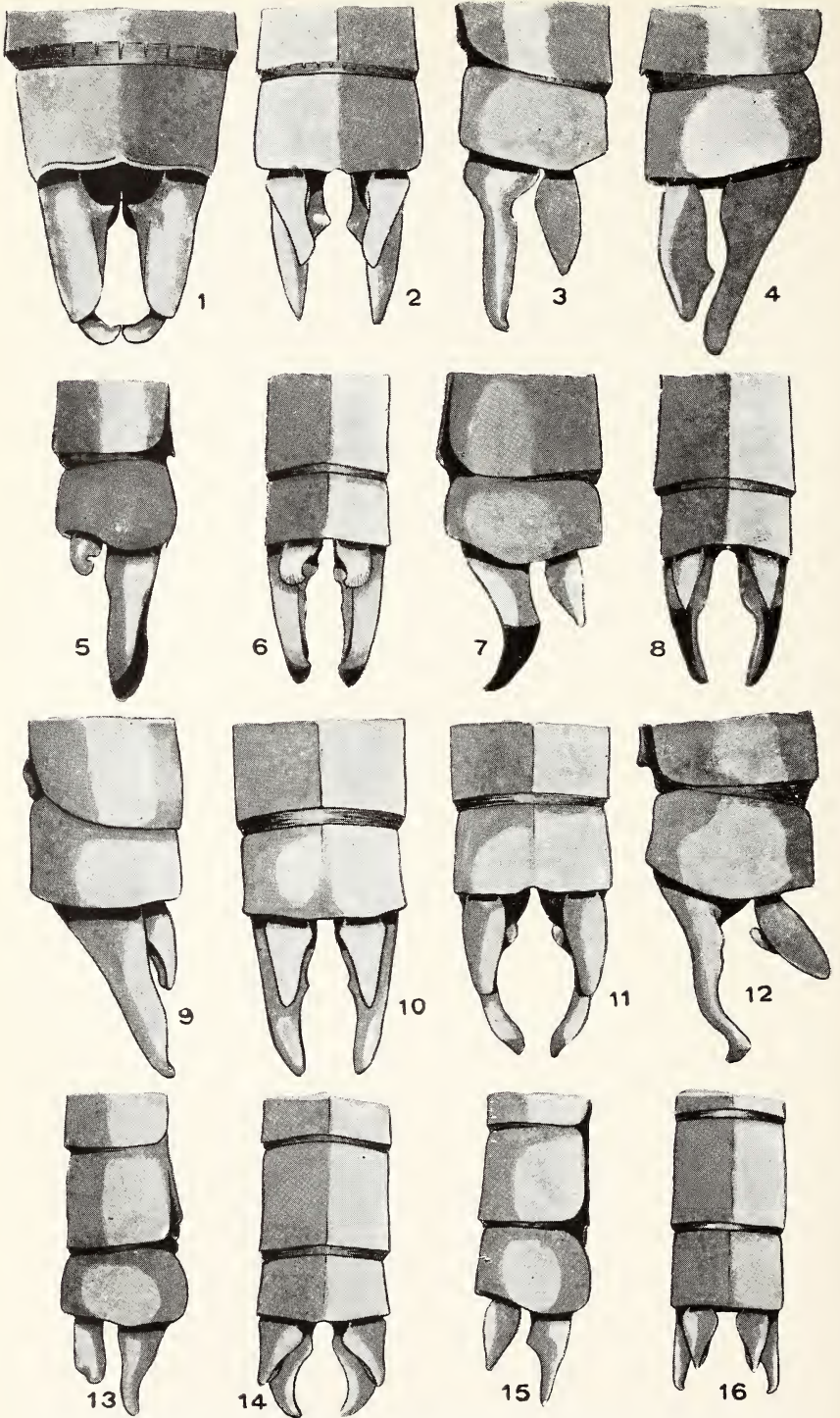


INDIAN DRAGONFLIES.



Anal appendages of Dragonflies. (For explanation of plate see end of article.)

INDIAN DRAGONFLIES.¹

BY

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PART XLI.

(With 2 plates and 2 text-figures).

(Continued from page 151 of this volume).

Genus: *COPERA* Kirby (1890).

Platycnemis pars Ramb. Ins. Névrof. p. 240 (1842).

Psilocnemis Selys, Bull. Acad. Belg. (2) xvi, p. 163 (1863); Id. Mem. Cour. xxxviii, p. 121 (1886); Laid. Fascic. Malay. (Odon), Part II, p. 7 (1907).

Copera Kirby, Cat. Odon. p. 129 (1890); Laid. Rec. Ind. Mus. Vol. xiii, p. 336 (1917); Munz, Mem. Amer. Soc. Ent. No. 3, p. 54 (1919); Fras. Journ. Bom. Nat. Hist. Soc. Vol. xxix, p. 744 (1923); Id. ibid. Vol. xxxv, p. 646 (1932).

Pseudocopera Fras., Mem. Dept. Agric. India (Ent.) No. 7, Vol. vii, p. 56 (1923).

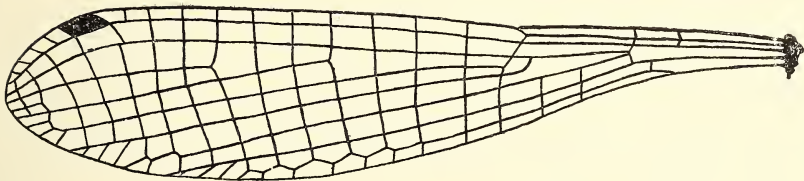


FIG. 1.—Wing of *Copera marginipes* (Ramb.)

Zygopterous dragonflies of small size and rather slender build, with abdomen less than twice the length of hindwings, coloured variably black or brown

¹ Mr. D. E. Kimmins of the British Museum has called my attention to what he believes to be an important error in Part XXXIX of this series, one however which is more apparent than real.

Dr. Laidlaw's Revision of the genus *Coelliccia* was published in the Records of the Indian Museum in the month of March 1932, whereas my paper (Part XXXIX) dealing with the same genus, appeared in the previous month of the same year. The authorship of the species *C. vacca*, *loringae*, *loogali* and *fraseri* ascribed to Laidlaw, would therefore appear to belong to myself by the laws of priority. As a matter of fact Dr. Laidlaw's MS. containing the descriptions of these species, passed through my hands and was forwarded to the Editor of the Records by myself personally long before my own paper was completed and sent for publication. Delay in the publication of the Records led to my paper appearing first; this should be perfectly clear from the synonymy given in my paper which gives the MS. as in possession of the Editor of the Records and shows that it was actually received for publication in the year 1931. The authorship of these species clearly belongs to Dr. Laidlaw.

with intricate or simple markings in white, yellow or pale brown, less commonly in pale blue, tenerals and sub-adults pure white with black markings which gradually obscure the white background as the insect becomes fully adult; wings hyaline, moderately rounded at apices, never falcate, petiolated to the level of the proximal antenodal nervure; discoidal cell elongate, with costal and posterior sides nearly equal in length, distal side about half as long again as the basal so that the cell gradually dilates distad; sectors of arc arising from lower end of arc and markedly divergent from origin; no accessory basal postcostal nervures present; *Ac* situated about midway between the two antenodal nervures; *Ab* always present and complete, continued on as *IA* which extends for about the basal half of wings; *Cu₁* extending about 5 to 6 cells beyond the end of *IA*, about 12 cells in length; *Riv+v* arising well proximal of the level of subnode; *IR₁* at the level of the oblique nervure descending from it; pterostigma small, very oblique, diamond-shaped, braced, covering about 1 cell; cells of wings mainly quadrangular; 2 cells between the discoidal cell and the nervure descending from the subnode.

Head narrow, eyes smaller than in species of *Platysticta*; 2nd segment of antennae as long as or longer than 3rd., occiput simple, deeply hollowed out behind; prothorax with posterior lobe simple rounded and without appendages in both sexes; thorax and abdomen moderately robust, the latter cylindrical, very slim and long, dilated somewhat at the terminal segments, of even thickness in the females; anal appendages variable in the species, superiors usually considerably shorter than the inferiors.

Genitalia.—lamina deeply and narrowly cleft; hamules broad quadrate plates meeting across the middle line; penis with apical end curled up but not bifurcated at end, furnished on each side with long curling branches directed somewhat backwards and outwards; lobe flask-shaped. Legs in the males with the tibiae broadly or very broadly dilated except in a few species; females differing rather broadly from the males in colour, shape and markings; vulvar scales rather short and never extending beyond end of abdomen.

Genotype: *Copera marginipes* (Ramb.).

Key to species of Genus COPERA.

- | | | |
|----|--|-------------------------------|
| 1. | { The two hind pairs of tibiae white and widely dilated
The two hind pairs of tibiae yellow, reddish or brown, only moderately dilated | 2. |
| | | 3. |
| 2. | { Legs very long, hind femora extending nearly to end of segment 2; 2nd abdominal segment wholly black on dorsum; inferior anal appendages strongly arched downwards, black at apices
Legs short, hind femora extending only to end of thorax; 2nd abdominal segment with 2 dorsal blue spots; inferior anal appendages quite straight, white at apices | <i>C. annulata</i> Selys. |
| | | <i>C. superplatypes</i> Fras. |
| 3. | { Superior anal appendages one-fourth the length of inferiors
Superior anal appendages at least half the length of inferiors | <i>C. marginipes</i> (Ramb). |
| | | 4. |
| 4. | { Legs very long, tibiae not dilated, brownish; posterior lobe of prothorax of female without spines
Legs shorter, tibiae slightly dilated, citron yellow or brick-red; posterior lobe of prothorax of female with a pair of divergent, forwardly directed spines | <i>C. assamensis</i> Laid. |
| | | <i>C. vittata</i> Selys. |



The forest cable tram line, Kavalai, Cochin State. *Copera marginipes* and *Copera annulata* are found in the dark shady jungle bordering the line, whilst *Platysticta deccanensis* is found on small streams bordering the line.

Copera marginipes (Ramb.).

Platycnemis marginipes Ramb., Ins. Nérop. p. 240 (1842).

Psilocnemis marginipes Selys, Bull. Acad. Belg. (2), xvi, p. 168 (1863); Id. Mem. Cour. xxxviii, p. 127 (1886); Krug. Stett. Ent. Zeit. p. 102 (1898); Selys. Ann. Mus. Civ. Genov. (2) x, xxxii, p. 501 (1891).

Psilocnemis striatipes Selys, Bull. Acad. Belg. (2), xvi, p. 169 (1863).

Platycnemis lacteola Selys, Bull. Acad. Belg. (2), xvi, p. 167 (1863).

Copera marginipes Kirby, Cat. Odon. p. 129 (1890); Id. Journ. Linn. Soc. Zool. Vol. xxiv, p. 560 (1894); Mart. Mission Pavie, p. 18 (sep.) (1904); Laid. Fascic. Malay. (Odonata) Part ii, p. 8 (1909); Ris. Suppl. Ent. No. v, p. 18 (1916); Laid. Rec. Ind. Mus., Vol. xiii, pp. 322, 337. Pl. xiv, fig. 2 (1917); Fras. Journ. Bom. Nat. Hist. Soc. Vol. xxvii, p. 543 (1921); Id. ibid. Vol. xxix, p. 744 (1923); Id. Rec. Ind. Mus. Vol. xxvi, pp. 428, 498 (1924); Laid. Spolia Mentaw. (Odonata) Journ. Malay. Br. Roy. Asiatic Soc. Part ii, pp. 218-230 (1926); Fras. Rec. Ind. Mus. Vol. xxxiii, p. 448 (1931).

Male.—Abdomen 28-31 mm. Hindwing 16-18 mm.

Head.—Labium pale brown; labrum, bases of mandibles, genae, ante- and post-clypeus pale greenish yellow, the latter with a small black spot on each side of the middle line; frons and vertex with a broad bronzed black fascia extending from eye to eye followed by a broad greenish white or bluish stripe equally wide, which wraps round the sides of the posterior ocelli and runs back as a narrow bordering to each eye to become nearly confluent with a narrow similarly coloured stripe which traverses the occiput behind the eyes; these two pale stripes enclosing a broadly elliptical stripe on occiput; eyes black above, greenish at sides and below and with a narrow equatorial black band circumventing them and confluent with the black stripe traversing the vertex; beneath occiput broadly greenish white from the eyes inwards.

Prothorax bronzed black on dorsum and lower part of sides which are traversed by a broad pale greenish yellow stripe invaded at two points by the dorsal black; lower border narrowly pale yellow; posterior border very finely yellow, this lobe shallow and very broadly rounded.

Thorax bronzed black on dorsum for rather more than halfway to the humeral suture, the middorsal carina and border of antealar sinus very finely bordered with yellow; a narrow pale greenish yellow antehumeral stripe in continuation of the lateral prothoracic one and bifurcated above by a small black upper humeral spot; this stripe followed by a broad black fascia narrowing above and stippled on the middle of mesepimeron with tiny yellow spots; the sides beyond this pale greenish yellow as well as below thorax, marked with an irregular black stripe on the anterior border of the postero-lateral suture and a second curved and narrower black stripe on the middle portion of metepimeron.

Legs variably bright orange to dull reddish ochreous, the posterior two pairs of tibiae moderately broadly dilated and about equal in length to the femora.

Wings hyaline; pterostigma pale brown with a fine frame of yellow and thick black nervures, covering 1 cell, poorly braced; 12 postnodal nervures to forewings, 9 in the hind; 5 cells after the pterostigma between costa and radius.

Abdomen bronzed black as far as the middle third of segment 8 from which segment to the end of abdomen is pale bluish white or pale creamy white according to age; segment 1 with the apical border narrowly and the sides broadly pale greenish white but the latter bearing a short dark stripe; segment 2 with a narrow middorsal pale greenish white stripe not quite extending to apical border, the sides of this segment also pale, clouded with brownish; segments 3 to 6 with a pale stripe along the sides confluent with a narrow pale green white annule at the base of each segment; lower border of segment 9 and the basal third of 8 narrowly black.

Anal appendages pale yellow to white, inferiors tipped with black beneath. Superiors half the length of segment 10, vestigial, tiny rounded tubercles with the apex pointed and hooked strongly ventrad; inferiors at least four times as long as the superiors, broad at base, tapering but slightly to a rounded obtuse apex, slightly separated at base, apices sloping inwards and finally meeting, inner surfaces rounded or hollowed out.

Female.—Abdomen 29-30 mm. Hindwing 20 mm.

Differs from the male in several respects.—the abdomen more robust and cylindrical, the ground-colour is drab and varying shades of brown, whilst the darker and black markings are more restricted.

Head.—Labrum with a tiny medial point of black at base; genae, bases of mandibles and clypeus palest brown, the latter with the same two black points seen in the male; frons warm brown; the broad black fascia on vertex replaced by a broken black line which broadens into a large black spot against the eyes; 2nd segment of antennae and distal end of 3rd creamy white; rest of upper surface of head and occiput pale brown or fawn marked with a narrow interrupted black stripe just behind ocelli, not extending out as far as eyes, and a second longer, equally narrow black stripe on occiput behind eyes; beneath head dirty white; eyes similar to the male but the polar cap dark olivaceous brown.

Prothorax and thorax violaceous brown on dorsum with a similar bronzed black fascia on middorsum as seen in the male, pale brown laterally with the black markings largely obsolete, the upper humeral spot present but the post-humeral black stripe reduced to a lower zigzagged marking, whilst the stripes on the postero-lateral suture and metepimeron are mere black lines. Posterior lobe of prothorax deeply notched, a small triangular lobe arising from the centre of notch and projecting forwards slightly to overlap the middle lobe.

Legs brownish white or carnesous; femora with a speckled band or longitudinal black stripe running the whole length of their outer sides, most conspicuous on the hinder pair; tibiae undilated.

Wings similar to the male; 12 to 13 postnodal nervures to forewings, 11 in the hind; pterostigma slightly paler and more elongate.

Abdomen warm brown on dorsum deepening to broad black apical annules on segments 3 to 6 and the greater part of 7; markings on segments 1 to 7 similar to the male; apical half of segment 8 and the whole of 9 and 10 pale brownish white or creamy white in sub-adults. Anal appendages shorter than segment 10, pale brownish white; vulvar scale brown, barely reaching end of abdomen.

Distribution.—This, the commonest species of the genus is widely distributed throughout southern Asia and the Sondaic Archipelago. The type, which I have been unable to examine, is from Java and formed part of the old Serville collection and is now, I believe, incorporated in the Selysian collection. Java specimens resemble those from Siam and Burma, the above description being made from one from the latter country. The species shows an infinite number of varieties, not only according to the age of the specimens, tenerals being white with a few scanty black markings, but also according to the locality of origin. Unfortunately even in the latter, varieties crop up so that it is difficult to say that a number of races exist. It seems safer with our present knowledge and material, to classify them all as mere varieties of one species. Several species however have been described which appear to me to be of no greater value than varieties. Among these is *C. acutimargo* Kruger, recorded by Laidlaw from Mergui, Lower Burma. I possess specimens taken in the same locality, but after careful comparison, am unable to appreciate sufficient differences to separate them from specimens from Western India, which I have valued as mere varieties of *C. marginipes*. All of these differ from the Burmese form by segment 8 which is entirely black.

Ceylon forms.—Abdomen 34 mm. Hindwing 18 mm.

Usually long and slender abdomen, almost double the length of hindwing; postclypeus and frons black forming a continuous black area with the vertex as far back as the level of the antennae; 2nd and 3rd segments of antennae black tipped with white; the broad black fascia on occiput divided transversely into two stripes, a broad one anteriorly shaped like the propeller of an aeroplane, and a narrow one lying well behind the former. Lateral markings of thorax much reduced, the post-humeral stripe only present below and broken up into tiny spots above; the stripes on the postero-lateral suture and metepimeron absent. Legs bright brick-red. Wings with 13 and 11 postnodal nervures respectively; pterostigma black framed finely in yellow.

Abdomen black above on segments 3 to 8 with sharply defined pale blue annules on segments 3 to 7, very narrow on the latter; segment 2 has the pale middorsal stripe heavily bordered with black on each side and there is an apical annule the ends of which tend to encircle the ends of the stripes;

segment 8 has the apical border and a small diamond-shaped apical spot pale blue, whilst segments 9 and 10 and the anal appendages are entirely pale blue, only the extreme tip of the latter being black, whilst their shape does not differ from type.

Female.—Abdomen 30 mm. Hindwing 18 to 19 mm.

Labrum and bases of mandibles bright yellow; postclypeus with the black spots larger; black stripe on front of vertex more reduced; 2nd segment of antennae only pale coloured; occiput black except for a mere vestige of a postocular stripe.

Posterior lobe of prothorax with the middle lobe longer and the lateral forming small rounded lobes recurved forwards. The dark stripes on femora broken up into a chain of tiny black dots. Abdomen very similar to type but the black apical annules sending lateral prolongations basad which form letters of U, the arms of which embrace the medial white stripe and bordering black; segments 9 and 10 and anal appendages creamy white. (Described from a pair taken *in cop* at Kandy, 2,000 ft. during August.)

Coorg forms.—Male.—Abdomen 32 mm. Hindwing 18 mm.

Black markings on head more extensive, the postclypeus, frons and vertex forming one confluent area, the pale stripe separating this area from the occiput very narrow and almost obsolete, the dark areas of occiput extending out as far as the eyes, markedly bronzed, almost dark green metallic; the post-orbital stripe very broad.

Prothorax and thorax with equally extensive melanism, the former with a very narrow lateral stripe only, the middorsal bronzed area extending out as far as the humeral suture above and nearly as far below; the post-humeral stripe extending broadly upwards as far as base of wings and enclosing with the dorsal black a narrow pale humeral stripe which traverses the humeral suture obliquely from below upwards; the black stripe on the sides more extensive and made up of stippled spots irregularly confluent.

Legs bright brick-red, the tibiae moderately dilated. Wings with 12 to 14 postnodal nervures and 11 to 12 respectively; a very narrow pterostigma almost twice as long as broad, dark reddish brown finely framed in pale brown. Abdomen and anal appendages similar to the Ceylon forms but the inferior appendages palely ochreous.

West Coast forms.—These are intermediate between the forms described from Coorg and the type and come mainly from Mahableshwar and the ghats near Bombay. The pattern of the black markings on head shows much variation but the pale stripe traversing vertex is moderately broad in all and the black occipital fascia falls just short of the eyes; postclypeal markings vary from large spots to entire blackness; pterostigma long and narrow as in Coorg forms; segment 9 with its sides, especially at the basal end broadly black; inferior anal appendages black as far as base on the outer sides.

Deccani forms.—Abdomen 26 mm. Hindwing 14 mm.

These are from Poona, and Mhow, C.P., and show a marked reduction of melanism, especially in the females, the heads of which are entirely without black markings and wholly pale khaki brown. Males from the Central Provinces have the postclypeus unmarked and the frons narrowly bordered with pale brown in front; the occipital black markings are reduced to two large pyriform spots finely united by a median black line, the postorbital stripe being nearly obsolete. The lateral markings of thorax obsolete save for the lower part of the post-humeral marking. Legs carneau. Pterostigma markedly narrowed. They represent the smallest forms of the species and their pale colour is the outcome of their semi-desert surroundings.

In addition to the absence of black head markings in the female, the lateral markings of thorax are obsolete and the middorsal bronzed area very narrow; markings on abdomen reduced to a mere middorsal dark brown stripe extending as far as segment 8, whilst 9 has two subdorsal basal streaks and 10 is unmarked. The posterior lobe of prothorax shaped as for type. Wings in adults deeply enfumed.

Assam forms.—Males closely resemble those from the West Coast, whilst the females have the dark stripes on head broken up into isolated bronzed green spots recalling strongly those found in *Sympyca*. The lateral thoracic markings much reduced. Posterior lobe of prothorax similar in shape to that of the Ceylon form. These are obviously dry season forms and were taken at Margherita, Assam during May.

Bengal forms.—A pair from Jalpaiguri show the black markings much reduced, the occipital markings in the male tending to be broken up into isolated spots, and in the female, represented only by tiny black points lying in a pale area. Here again modification of the posterior lobe of prothorax is found. A dry season form taken in March.

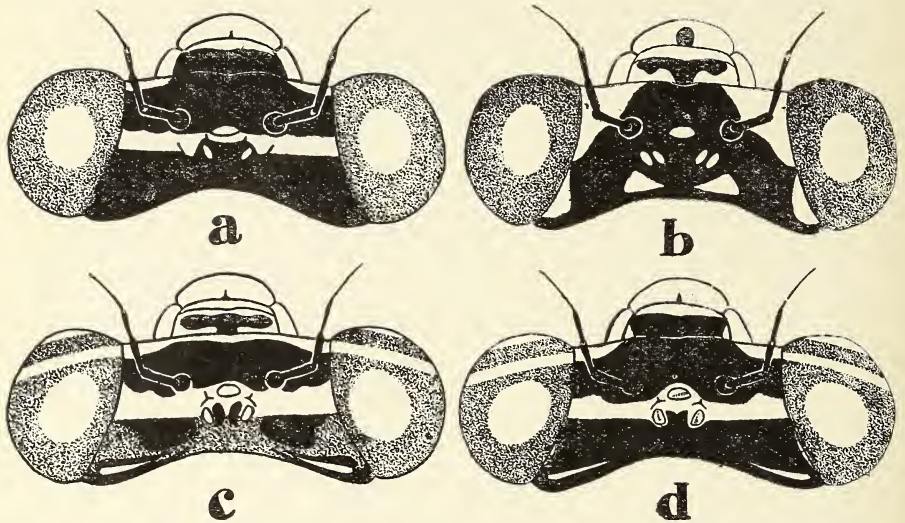


FIG. 2.—Dorsal view of heads of—(a) *Copera superplatypes* Fras. ♂. (b) *Copera annulata* (Selys) ♂. (c) *Copera vittata* (Selys) ♂, from Coorg. (d) *Copera marginipes* (Ramb) ♂, from the West Coast.

Copera vittata (Selys).

Psilocnemis vittata Selys, Bull. Acad. Belg. (2) xvi, p. 170 (1863); Id. Mem. Cour. xxxviii, p. 121 (1886).

Copera vittata Kirby, Cat. Odon. p. 129 (1890); Laid. Rec. Ind. Mus. Vol. viii, pp. 342, 343 (1914); Krug. Stett. Ent. Zeit. p. 102 (1898); Fras. Journ. Bom. Nat. Hist. Soc. Vol. xxix, p. 744 (1923); Id. Rec. Ind. Mus. Vol. xxvi, pp. 428, 498 (1924).

Copera vittata deccanensis Laid. Rec. Ind. Mus. Vol. xiii, pp. 323, 327-329 (1923); Fras. Journ. Bom. Nat. Hist. Soc. Vol. xxix, p. 744 (1923); Id. Rec. Ind. Mus. Vol. xxxiii, p. 448 (1931).

Psilocnemis serapica Selys, Bull. Acad. Belg. (2) xvi, p. 171 (1863).

Male.—Abdomen 30 to 32 mm. Hindwing 16 to 18 mm.

Head.—Labium pale reddish brown; labrum bright greenish yellow; genae and bases of mandibles pale bluish green; anteclypeus pale; postclypeus, frons and vertex black, the latter traversed from eye to eye by a moderately broad pale bluish green stripe which passes between the anterior and posterior ocelli; behind occiput a postocular narrow creamy white stripe; eyes capped above with black, olivaceous green below and with a narrow black equatorial stripe circumventing the eyes.

Prothorax black with a narrow ochreous stripe on each side; posterior lobe broadly rounded.

Thorax bronzed black on dorsum nearly as far as humeral suture, the space between the humeral and ante-lateral sutures dark chocolate brown or blackish stippled with a few coarse yellow spots, the two dark areas separated by a narrow humeral ochreous stripe; the sides posterior to the antero-lateral suture bluish or yellowish, an obscure vestigial brownish stripe anterior to the suture and a second more pronounced on the middle of metepimeron; beneath thorax yellow. Legs reddish, the two hinder pairs of tibiae very slightly dilated.

Wings hyaline; pterostigma much less elongated than in *C. membranipes*, squared outwardly, dark reddish brown, paler at its circumference, framed in black nervures, covering 1 cell, very poorly braced; 10 to 13 postnodal nervures to forewings, 10 in the hind.

Abdomen black on dorsum and laterally as far as segment 10 which latter is pale blue; segment 9 also with a small apical blue dorsal spot which sometimes extends halfway along segment towards its base; segments 3 to 7 with very narrow pale blue basal annules and with the white of ventral surface expanding subapically on to sides; segments 1 and 2 warm brown, the former with the dorsum largely black, the latter with the middorsal carina finely pale blue bordered with black.

Anal appendages.—Superiors pale blue or creamy white, as long as segment 10, conical, depressed, acute and tapered at apex; inferiors nearly twice the length of superiors, broad at base, tapering to apex and directed somewhat obliquely inwards so as to meet at apices, pale within, blackish brown externally and armed with a small obtuse spine at middle of inner border. Penis broadly blunt at apex, the apical end curled over to embrace the stem of organ, broadening at end where it is shallowly grooved to embrace the stem, the outer angles being produced into a point but not branched.

Female.—Abdomen 28-30 mm. Hindwing 18 mm.

Differs rather strongly from the male.—the abdomen much more robust and cylindrical throughout, the black markings more restricted.

Head.—Labrum bright yellow with a small medial basal black point and its base also narrowly black; genae, bases of mandibles greenish yellow; frons and vertex purplish brown with a moderately broad transverse black band extending from eye to eye at base of antennae; the transverse black fascia on occiput absent but the postocular stripe present; ocellar space paler, forming an ill-defined pale stripe; 2nd segment of antennae white, the 3rd pale brown.

Prothorax blackish brown with a pale stripe on each side; posterior lobe deeply notched with a small median lobe lying within the latter and with the angles of the lobe prolonged forwards as fine strongly divergent spines. Thorax pale brown marked very similarly to the male.—the middorsal bronzed area narrower, the middorsal carina and antealar sinus finely yellow; a large black spot on upper part of humeral suture and the suture below this finely delineated in black; the post-humeral black band very ragged and interrupted by large pale spots, extending for only two-thirds up the sides of thorax; the band bordering the postero-lateral suture very broad; two narrow stripes on metepimeron, one of which lies just posterior to the suture and is interrupted above, the other shorter and narrower bordering the thorax below. Beneath pale brown marked with three large black spots.

Legs yellow, all femora with the speckled band on extensor surfaces. Wings hyaline more or less palely enfumed; pterostigma subquadrate, shaped very much as in the male but rather shorter, blackish brown framed in yellow and black nervures, covering 1 cell, poorly braced; 14 postnodal nervures to forewings, 12 in the hind.

Abdomen dark purplish brown changing to black on segments 7 to 10; segments 1 and 2 similar to the male; segments 3 to 7 with narrow pale yellow or white basal annules; segment 9 with a broad brownish white T-shaped spot on its dorsum, whilst segment 10 is entirely of that colour except laterally. Anal appendages brownish white, conical, pointed, surmounting a large conical protuberance. Vulvar scales dark brown, robust, extending to end of abdomen.

Distribution.—Almost identical to that of *C. marginipes* if we consider all the numerous species and varieties which have been described as differing from the latter but which here are considered of not more than racial value. Colour and markings appear to have been the main reason for creating new species but as varying degrees of melanism are found even in the same locality and depend so much on the age of the specimen or the time of the year at which it occurs, wet and dry season forms undoubtedly occurring, markings are no criterion for splitting up the species. *C. atomaria* Selys, from Borneo, represents the maximum amount of melanism found in the species, whilst dry season forms from the Deccan show remarkably little of this. The author has been able to examine specimens from the West Coast of India, Coorg, Nilgiris, Anaimallai Hills, Assam, Burma, and Siam and has found an

infinite variety in the markings which are often confluent or as often discrete. On the other hand none differs in the shape of the anal appendages, the legs of the male or the posterior lobe of the prothorax of female. Dr. Laidlaw has described the West Coast form as a subspecies under the name of *C. vittata deccanensis*. Although during life or in spirit, these specimens appear to be more brightly coloured than those from elsewhere, after death and dryage they become rather drab insects. Thus during life the legs of *C. vittata deccanensis* are bright citron yellow, the sides of thorax bright greenish yellow and the humeral stripes, abdominal markings and anal appendages pale blue, these colours giving place to pale browns or ochreous etc. after death. *C. serapica* Selys, from the Nicobars is most certainly a female of *C. vittata*, as the shape of the posterior lobe of prothorax at once determines it.

Males of *C. vittata* are readily determined from other species by the straight anal appendages, the superiors being half the length of the inferiors, and also by the very slight dilatation of the tibiae.

Females are most easily determined by the divergent spines on the posterior lobe of prothorax, absent in other species, and by the three black spots beneath thorax. The type is in the Selysian collection and has been erroneously described as having the labrum black. Paratypes are to be found in most national collections and a number of private ones. This species and *C. marginipes* inhabit the same spot and have identical habits; they are to be sought for in dark gullies or among the scrub of shady jungles, where the white tenerals may be seen moving about as the so-called 'Ghost forms' and have a highly characteristic sinuous flight. Adults being more cryptically coloured, are seen with greater difficulty and must be gently beaten up.

They are rarely seen over water and the act of oviposition has never been witnessed; they breed however in tiny brooks and runnels leading into larger rivers.

Copera assamensis Laidlaw.

Copera assamensis Laid. Rec. Ind. Mus. Vol. viii, pp. 342, 343 (1914); Id. ibid. Vol. xiii, p. 338 (1917).

Male.—Abdomen 32 to 34 mm. Hindwing 17 to 18 mm.

Head.—Labium palest brown; labrum yellow; bases of mandibles and genae greenish yellow; anteclypeus pale brown; postclypeus, frons and vertex black, the latter traversed from eye to eye by a moderately broad creamy white stripe at level of ocellar space; distal end of 2nd segment of antennae yellow; occiput reddish brown marked in full adults anteriorly and posteriorly by a diffuse black border and by a narrow postocular black stripe lying behind an equally narrow pale yellow stripe. Eyes dark brown above, olivaceous below and circumvented by a narrow blackish brown equatorial belt.

Prothorax brown with the posterior lobe, three short parallel stripes on middle lobe and a broad lateral stripe black.

Thorax brown or carneous marked irregularly with black as follows.—a broad bronzed black band on middorsum extending out for rather more than half-way to the humeral suture, which latter is finely delineated in black but expands into a small black spot above; middorsal carina and borders of antealar sinus finely yellow or ferruginous; on the sides a continuation of the lateral black belt seen on the prothorax which extends for a short distance on to mesepimeron and breaks up into two obscure mottled fasciae; postlateral suture finely black and a short black stripe on the metepimeron; beneath yellowish. Legs reddish or reddish brown, the tibiae undilated (Laidlaw states of the type that the hind pair only show a trace of dilatation but in the example before me I am unable to see any sign of this so that it may be variable).

Wings hyaline; pterostigma dark reddish brown framed in pale yellow and thick black nervures, the distal side nearly straight, the proximal very oblique, subquadrate, barely longer than broad, poorly braced, covering 1 cell; 13 postnodal nervures in forewings, 11 in the hind.

Abdomen black ringed with pale blue basal annules; segment 1 ochreous with a curved black stripe on each side and a short apical subdorsal black stripe; segment 2 with a pale creamy white stripe on middorsum bordered heavily with black and not extending to apical border of segment and with an apical crenate black line which embraces the ends of the dorsal pale and

black stripes; segments 3 to 8 black with narrow basal blue annules and the black extending on to the sides at apex of segments to form broad apical annules; the sides of segments 3 to 6 pale; segment 9 with its basal half black or else entirely pale creamy white; segment 10 entirely this colour except laterally.

Anal appendages very similar to those of *C. vittata*; superiors creamy white, triangular as seen from above, conical and subcylindrical as seen in profile, hollowed out within; inferiors nearly twice the length of superiors, dark reddish brown, outer surface black especially towards apex, extending straight back, obtuse at apex, broad at base, subcylindrical thereafter. Penis similar to that of *C. marginipes*.

Female.—Abdomen 30 mm. Hindwing 17 mm.

Differs from the male by its more robust build, especially the abdomen which is of even width throughout, and also by the black markings more extensive. Head marked as in the male but the occiput entirely black save for the postocular pale stripes; the black fasciae on vertex rather broader. Prothorax coloured similarly to the male; posterior lobe shaped as in *C. vittata*, but without spines.

Thorax with the humeral and lateral black markings more extensive and mottled with coarse yellow spots. Wings similar to the male; legs yellowish, femora with the characteristic beaded black band on extensor surface.

Abdomen blackish brown to black on the terminal segments, the 9th and 10th bearing pale brown dorsal spots. Anal appendages pale brown, conical, pointed; vulvar scales robust, dark brown.

Distribution.—From Assam to Indo-China. The type in the Indian Museum has the upper surface of head mainly brown and with no black markings save for the transverse black stripe on vertex. A specimen from Siam in the author's collection has the markings more developed and are as described above. The male is easily distinguishable from *C. vittata* by its much longer legs without dilatation of the tibiae, this latter character separating it from all other species of the genus. The female described above by Laidlaw may not be that of *C. assamensis* as it does not differ materially from that of *C. vittata*. (Forster stated that the females of this genus were dimorphic but after examining many scores, I am unable to agree with or corroborate this; it would be more correct to say that they are polychroic according to age and season.

Copera annulata Selys.

Ptilocnemis annulata Selys, Bull. Acad. Belg. (2) xvi, p. 172 (1863); Id. Mem. Cour. xxxviii, p. 124 (1886).

Ptilocnemis subannulata Selys, (2) Mem. Cour. xxxviii, p. 125 (1886).

Copera subannulata Kirby, Cat. Odon. p. 129 (1890); Laid. Rec. Ind. Mus. Vol. xiii, p. 337 (1917).

Copera annulata Kirby, Cat. Odon. p. 129 (1890); Laid. Rec. Ind. Mus. Vol. viii, pp. 341, 342 (1914); Ris. Suppl. Ent. No. v, pp. 17, 18 (1916); Laid. Rec. Ind. Mus. Vol. xiii, pp. 322, 337 (1917); Fras. Journ. Bom. Nat. Hist. Soc. Vol. xxix, p. 744 (1923).

Copera annulata stevensi Laid. Rec. Ind. Mus. Vol. viii, pp. 341, 342 (1914); Id. ibid. Vol. xiii, p. 337 (1917).

Copera arachnoides Fras. Mem. Dept. Agric. India (Ent.) Vol. vii, No. 7, pp. 56, 57, Pl. vii, fig. 4 (1922).

Male.—Abdomen 35 to 37 mm. Hindwing 22 to 23 mm.

Head.—Labium white; labrum, genae, bases of mandibles and clypeus pale blue, the former with a tiny median black point at base, the latter with a variable transverse black mark confined to the middle of postclypeus or extending by a short median stalk to its base in others; frons and vertex in front and laterally pale blue with a broad bronzed black triangular area which begins near front margin of frons and extends to back of occiput, touching the eyes at a point only in line with the posterior ocelli, from which point it recedes again to leave a clear pale blue area against the eyes; this dark area marked with a small oval or triangular white spot between the posterior ocelli and bases of antennae, and on back of occiput by two large triangular white spots near the middle line, whilst in some specimens there is a second smaller triangular spot lying to the outer side of these; occiput beneath eyes bluish; eyes black above, olivaceous at sides and below.

Prothorax bronzed black with a lateral pale blue stripe extending its whole length.

Thorax bronzed blackish green on dorsum marked on each side with a narrow pale blue antehumeral stripe lying in juxtaposition to the humeral suture; a small upper post-humeral white spot (in Burmese specimens) or a white sickle-shaped mark (in Bengal or Assamese forms); laterally and beneath palest blue, the postero-lateral suture broadly mapped out in black.

Legs pure white, the distal ends of all femora and extreme proximal ends of tibiae black; hind femora extending to end of second segment of abdomen; tibiæ very broadly dilated; tarsi black.

Wings hyaline; pterostigma reddish brown framed in white and then thick black nervures, poorly braced, covering 1 cell, more or less diamond-shaped, less so in forms from Assam; 13 to 16 postnodal nervures in forewings, 12 to 14 in the hind, the greater number in Assam forms; petiolation beginning just distad the level of proximal antenodal nervure.

Abdomen bronzed black on dorsum except segments 9 and 10 which are pale blue (Assam forms have the basal third or more of segment 9 black, whilst some Burmese forms have the whole of segment 9 and a small diamond-shaped apical dorsal spot on segment 8); segments 1 and 2 with the sides broadly blue but narrowing apicad on the latter, whilst all segments from 3 to 6 have the lower part of sides bluish; segment 2 with its base narrowly blue, segments 3 to 6 with narrow pale blue annules confluent laterally with the blue on sides.

Anal appendages pale blue or white, the apical half of inferiors black. Superiors conical, triangular, acute at apex, as long as segment 10; inferiors broad at base, tapering to an acute apex, curved strongly downwards and very slightly inwards.

Female.—Abdomen 33 to 37 mm. Hindwing 22 to 34 mm.

Differing in some respects from the male, as follows:—Head with an extension of the pale blue into the apex of the black triangle, this very variable (Assam forms are exactly similar to the males save for a pair of obscure spots, one on each side of the anterior ocellus), the frons broadly blue and more or less confluent with a series of spots on the ocellar space.—a small triangular spot on each side of anterior ocellus, another between the posterior ocellus and base of antennae as in the male, a median small triangular spot between the posterior ocelli and a spot on the outer side of each postocular spot often confluent with the latter. In some specimens, the whole of the ocellar space blue except for a narrow black bordering to the inner sides of the posterior ocelli.

Legs of great length, reddish or of the same colour as the males but with none of the tibiae dilated.

Prothorax and thorax exactly similar to the male; posterior lobe of former simple, projecting back at the middle and with a slightly crenate border.

Abdomen similar to the male except for segments 9 and 10, the former with two large subdorsal bronzed greeny black spots broadly confluent at base and along basal half of middorsum, its apical border and the whole of segment 10 pale blue.

Anal appendages very short, pale blue, conical; vulvar scales pale, not extending to end of abdomen.

Distribution.—Assam, Bengal, Malaysia, Indo-China and China. Selys also gives Japan on the authority of a specimen labelled Yokohama, in the Zurich Museum. The species, named from a female by Selys, from Malacca, as *Copera ciliata* is probably not more than a variety of this species and Selys expresses such an opinion in the *Revision des Syn. Agrionines*. This species is quite easily distinguished from all others except *Copera superplatypes* by its pronounced black colour with pale blue markings, by its broadly dilated white tibiae, and from all other species by the shape of its inferior anal appendages. The shape of the posterior lobe of prothorax and the very long hind-legs will determine the female from other females of the genus. The type in the Selysian collection, paratypes in most national collections and in the British and Indian Museums.

Contrary to the habits of *C. marginipes* and *C. vittata*, both of which breed in running water, this species breeds in weedy ponds and small lakes. The author found it quite common in the Botanical Gardens, Calcutta, resting on sedges at the borders of most tanks there. Many teneral were flushed out from beneath bushes in the neighbourhood of the tanks.

Copera superplatypes Fraser.

Copera superplatypes Fras. Rec. Ind. Mus. Vol. xxix, pp. 88, 89, figs. 6b and 7b (1927).

Male.—Abdomen 26 mm. Hindwing 15 mm.

Head.—Labium white; labrum, anteclypeus and genae palest blue, rest of head black save for a moderately broad pale blue stripe traversing the vertex from eye to eye at level of ocellar space.

Prothorax black with a pale bluish white stripe and a spot of the same colour on each side.

Thorax bronzed black as far lateral as the anterior suture marked with pale blue antehumeral stripes bordering the humeral suture anteriorly; laterally pale blue, the postero-lateral suture mapped out in black, a black spot on the mesepimeron confluent with the black in the humeral region, and another large black spot on the centre of metepimeron; beneath blue bordered with black.

Wings hyaline; pterostigma black, covering 1 cell, diamond-shaped, slightly longer than broad, poorly braced or not at all; 12 to 13 postnodal nervures in forewings, 11 in the hind; petiolation beginning well proximal of *Ac* which lies about midway between the level of the two antenodal nervures.

Legs very short, hind femora extending only to end of thorax, pure creamy white with black spines but the distal halves of all femora black; the two hind pairs of tibiae enormously dilated, about two and a half times the width of the hind femora.

Abdomen black, the sides of segment 1 bluish white; segment 2 with a pair of oval blue dorsal subbasal spots (similar to those found in a similar situation in several species of genus *Agriocnemis*), the sides of same segment bluish, broadly so at apical end; segments 3 to 5 with the lower parts of sides bluish and confluent with narrow pale blue basal annules narrowly interrupted on the middorsum; segments 6 to 8 similar but the basal annules more widely interrupted and the lateral blue extending sub-apical for a short distance up the sides; segment 9 unmarked; segment 10 with the dorsum palest blue.

Anal appendages creamy white, the inferiors blackish at base. Superiors slightly shorter than segment 10, conical, depressed, acute at apices; inferiors one-third longer than superiors, very broad at base, abruptly tapered and ending in a sharp point.

Female unknown. Type in the author's collection, the only known specimen.

Distribution.—A single male from Hasimara, Duars, Bengal. This species which belongs to the group *annulata*, is easily distinguished by the following characters.—the black vertex traversed by a blue stripe instead of the broad black triangle spotted with white seen in *C. annulata*, the shape of the anal appendages of which both pairs are directed back and are very similar in shape, the enormous dilatation of the tibiae which are out of all proportion to the small size of the insect, and lastly the very characteristic marking on the dorsum of segment 2.

EXPLANATION OF PLATE I.

1. Dorsal view of anal appendages of *Indocnemis kempfi* Laid.
2. Dorsal view of anal appendages of *Copera assamensis* Laid.
3. Left lateral view of same.
4. Right lateral view of anal appendages of *Indocnemis kempfi* Laid.
5. Right lateral view of anal appendages of *Copera marginipes* (Ramb).
6. Dorsal view of same.
7. Left lateral view of anal appendages of *Copera annulata* (Selys).
8. Dorsal view of same.
9. Left lateral view of anal appendages of *Copera vittata* (Selys).
10. Dorsal view of same.
11. Dorsal view of anal appendages of *Calicnemis mortoni* Laid.
12. Left lateral view of same.
13. Right lateral view of anal appendages of *Platycnemis latipes dealbata* Selys.
14. Dorsal view of same.
15. Right lateral view of anal appendages of *Copera superplatypes* Fras.
16. Dorsal view of same.

(To be continued).